What is claimed is:

1. A continuous method for producing at least one polyol from lactose comprising:

(a) hydrolyzing lactose to produce a hydrolyzate that includes at least one monosaccharide;

(b) subsequently hydrogenating the hydrolyzate to produce an alditol-containing intermediate composition; and

(c) hydrogenolyzing the alditol-containing intermediate composition to produce at least one polyol.

2. A method according to claim 1 wherein step (a) comprises hydrolyzing lactose to convert about 90 at about 100 weight % of the lactose into monosaccharide.

3. A method according to claim 1 wherein step (a) is completed prior to initiation of step (b).

4. A method according to claim 1 wherein step (c) is performed in the presence of a catalyst comprising a plurality of porous particles on which are deposited (i) a nickel metal or reduced nickel as a dispersed phase and (ii) an additional metal as an additional dispersed phase.

5. A method according to claim 1 wherein the polyol comprises ethylene glycol, propylene glycol or glycerol.

6. A method according to claim 1 wherein the hydrolyzate comprises a mixture of glucose and galactose.

7. A method according to claim 1 wherein the alditol-containing intermediate composition comprises a mixture of sorbitol and dulcitol.

8. A method according to claim 1 further comprising providing the lactose in an aqueous composition that includes at least about 15 dry solids weight percent lactose based on the total weight of the aqueous composition.

9. A method according to claim 1 wherein step (c) further comprises adding a base to the alditol-containing intermediate composition.

10. A method according to claim 1 wherein steps (b) and (c) are performed in the presence of a catalyst having a support selected from titania in the rutile form, zirconia in the monoclinic form, high-surface area granulated carbon or boehmite.

11. A method according to claim 1 wherein steps (a), (b) and (c) are performed in an aqueous medium.

12. A method for producing at least one polyol from lactose comprising:

(a) hydrolyzing lactose to produce a hydrolyzate that includes at least one monosaccharide;

(b) catalytically hydrogenating the hydrolyzate to produce an alditol-containing intermediate composition, wherein the hydrogenation catalyst comprises ruthenium disposed on a titania support; and

(c) hydrogenolyzing the alditol-containing intermediate composition to produce at least one polyol.

13. A method according to claim 12 wherein the polyol comprises ethylene glycol, propylene glycol or glycerol.

14. A method according to claim 12 wherein the hydrolyzate comprises a mixture of glucose and galactose.

15. A method according to claim 12 wherein the alditol-containing intermediate composition comprises a mixture of sorbitol and dulcitol.

16. A method according to claim 12 further comprising providing the lactose in an aqueous composition that includes at least about 15 dry solids weight percent lactose based on the total weight of the aqueous composition.

17. A method according to claim 12 wherein the hydrogenation catalyst comprises ruthenium disposed on a rutile support.

18. A method according to claim 12 wherein step (c) is performed in the presence of a catalyst comprising a plurality of porous particles on which are deposited (i) a nickel metal or reduced nickel as a dispersed phase and (ii) an additional metal as an additional dispersed phase.

19. A method for producing at least one polyol from lactose comprising:

(a) catalytically hydrolyzing lactose to produce a hydrolyzate that includes at least one monosaccharide, wherein the hydrolysis catalyst comprises a solid acid or an enzyme;

(b) hydrogenating the hydrolyzate to produce an alditol-containing intermediate composition; and

(c) hydrogenolyzing the alditol-containing intermediate composition to produce at least one polyol.

20. A method according to claim 19 wherein the polyol comprises ethylene glycol, propylene glycol or glycerol.

21. A method according to claim 19 wherein the hydrolyzate comprises a mixture of glucose and galactose.

22. A method according to claim 19 wherein the alditol-containing intermediate composition comprises a mixture of sorbitol and dulcitol.

23. A method according to claim 19 further comprising providing the lactose in an aqueous composition that includes at least about 15 dry solids weight percent lactose based on the total weight of the aqueous composition.

24. A method according to claim 16 wherein the solid acid catalyst is selected from an ion exchange resin and a perfluorinated polymeric resin.

25. A method according to claim 19 wherein the enzyme comprises immobolized β-galactosidase.

26. A method according to claim 16 wherein step (a) does not include adding a liquid acid.

27. A method for producing at least one lower carbon polyhydric alcohol from lactose comprising:

(a) catalytically hydrolyzing lactose to produce a hydrolyzate that includes at least one monosaccharide, wherein the hydrolysis catalyst comprises a solid acid or an enzyme;

(b) subsequently catalytically hydrogenating the hydrolyzate to produce an alditol-containing intermediate composition, wherein the hydrogenation catalyst comprises ruthenium disposed on a titania support; and

(c) hydrogenolyzing the alditol-containing intermediate composition to produce at least one lower carbon polyhydric alcohol.

28. A method according to claim 27 wherein the hydrolyzate comprises a mixture of glucose and galactose.

29. A method according to claim 27 wherein the alditol-containing intermediate composition comprises a mixture of sorbitol and dulcitol.

30. A method according to claim 27 further comprising providing the lactose in an aqueous composition that includes at least about 15 dry solids weight percent lactose based on the total weight of the aqueous composition.

31. A method according to claim 27 wherein steps (a), (b) and (c) are performed in an aqueous medium.

32. A method for producing at least one polyol from lactose comprising:

(a) heating lactose in the presence of water and a solid acid catalyst to produce a first intermediate;

(b) subsequently heating the first intermediate in the presence of hydrogen and a catalyst to produce a second intermediate; and

(c) heating the second intermediate in the presence of hydrogen, a catalyst, and a base to produce at least one polyol.

33. A method according to claim 32 wherein step (a) comprises heating the aqueous lactose mixture at a temperature of about 50 to about 100 °C.

34. A method according to claim 33 wherein the solid acid catalyst is selected from an ion exchange resin and a perfluorinated polymeric resin.

35. A method according to claim 32 wherein step (b) comprises heating the first intermediate at a temperature of about 80 to about 180 °C.

36. A method according to claim 35 wherein the catalyst in step (b) comprises ruthenium disposed on a titania support.

37. A method according to claim 32 wherein step (c) comprises heating the second intermediate at a temperature of about 150 to about 300 °C.

38. A method according to claim 37 wherein the catalyst in step (c) comprises a plurality of porous particles on which are deposited (i) a nickel metal or reduced nickel as a dispersed phase and (ii) an additional metal as an additional dispersed phase.

39. A method for producing at least one polyol from lactose comprising:

(a) heating lactose in the presence of water and an enzyme to produce a first intermediate;

(b) subsequently heating the first intermediate in the presence of hydrogen and a catalyst to produce a second intermediate; and

(c) heating the second intermediate in the presence of hydrogen, a catalyst, and a base to produce at least one polyol.

40. A method according to claim 39 wherein the enzyme in step (a) comprises immobolized β-galactosidase.

41. A method according to claim 39 wherein step (a) is performed in an aqueous medium with a pH of about 3 to about 7.

42. A method according to claim 39 wherein step (b) comprises heating the first intermediate at a temperature of about 80 to about 180 °C.

43. A method according to claim 42 wherein the catalyst in step (b) comprises ruthenium disposed on a titania support.

44. A method according to claim 39 wherein step (c) comprises heating the second intermediate at a temperature of about 150 to about 300 °C.

45. A method according to claim 44 wherein the catalyst in step (c) comprises a plurality of porous particles on which are deposited (i) a nickel metal or reduced nickel as a dispersed phase and (ii) an additional metal as an additional dispersed phase.